

科目：統計學

適用：財金系

編號：242

考生注意：

1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

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1. The Wall Street Journal recently ran an article indicating differences in perception of sexual harassment on the job between men and women. The article claimed that women perceived the problem to be much more prevalent than did men. One question asked to both men and women was: "Do you think sexual harassment is a major problem in the American workplace?" Some 24% of the men compared to 62% of the women responded "Yes." Suppose that 150 women and 200 men were interviewed. Use  $\alpha = 0.05$ , test the hypothesis that the proportion of women who think sexual harassment is a major problem in the American workplace is larger than that of men. (10%)
2. A buyer for a manufacturing plant suspects that his primary supplier of raw materials is overcharging. In order to determine if his suspicion is correct, he contacts a second supplier and asks for the prices on various identical materials. He wants to compare these prices with those of his primary supplier. The data collected is presented in the table below, and the prices are normally distributed. The buyer believes that the differences are normally distributed and will use this sample to perform an appropriate test at a level of significance of 0.01. (10%)

	Primary	Secondary
Material	Supplier	Supplier
1	\$55	\$45
2	\$48	\$47
3	\$31	\$32
4	\$83	\$77
5	\$37	\$37
6	\$55	\$54

3. Nancy believes that the average running time of movies is equal to 140 minutes. A sample of 4 movies was taken and the following running times were obtained. Assume the population of the running times is normally distributed.

150 150 180 170

- (a) State the hypotheses and test the hypotheses at the 10% level of significance. (8%)

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- (b) Compute a 90% confidence interval for average running time of movies. (8%)

4. Assume the probability density function of random variables  $X$  as:

$$f(x) = \frac{1}{6\sqrt{\pi}} e^{-\frac{(x+3)^2}{36}}, \quad -\infty < x < \infty$$

Answer following questions.

- (a) Find the distribution of  $X$ . (4%)
- (b) What is the value of the  $P(0 < X < 10)$ ? (6%)
- (c) If the  $aX+b$  is the standard normal distribution, find the values  $a$  and  $b$ . (6%)

5. Consumers spend an average of \$21 per week in cash without being aware of where it goes. Assume that the amount of cash spent without being aware of where it goes is normally distributed and that the standard deviation is \$5.

- (a) What is the probability that a randomly selected person will spend more than \$25? (5%)
- (b) What is the probability that a randomly selected person will spend between \$10 and \$20? (5%)
- (c) Between what two values will the middle 95% of the amounts of cash spent fall? (5%)

6. The following table shows the number of students in three different degree programs and whether they are graduate or undergraduate students:

	Undergraduate	Graduate	Total
Business	150	50	200
Engineering	150	25	175
Arts & Sciences	100	25	125
Total	400	100	500

- (a) What is the probability that a randomly selected student is an undergraduate? (3%)
- (b) What percentage of students are engineering majors? (3%)



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- (c) If we know that a selected student is an undergraduate, what is the probability that he or she is a business major? (3%)
- (d) A student is enrolled in the Arts and Sciences school. What is the probability that the student is an undergraduate student? (3%)
- (e) What is the probability that a randomly selected student is a graduate Business major? (3%)
7. A microeconomist wants to determine how corporate sales are influenced by capital and wage spending by companies. She proceeds to randomly select 26 large corporations and record information in millions of dollars. The Microsoft Excel output below shows results of this multiple regression.

## SUMMARY OUTPUT

## Regression Statistics

Multiple R	0.830
R Square	0.689
Adjusted R Square	0.662
Standard Error	17501.643
Observations	26

## ANOVA

	df	SS	MS	F	Signif F
Regression	2	15579777040	7789888520	25.432	0.0001
Residual	23	7045072780	306307512		
Total	25	22624849820			

	Coeff	StdError	t Stat	P-value
Intercept	15800.0000	6038.2999	2.617	0.0154
Capital	0.1245	0.2045	0.609	0.5485
Wages	7.0762	1.4729	4.804	0.0001

- (a) What fraction of the variability in sales is explained by spending on capital and wages? (3%)
- (b) At  $\alpha = 0.05$ , test whether Capital has an influence on corporate sales? (3%)
- (c) At  $\alpha = 0.05$ , test whether wages has an influence on corporate sales?

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(3%)

- (d) What are the predicted sales (in millions of dollars) for a company spending \$100 million on capital and \$100 million on wages? (3%)
- (e) One company in the sample had sales of \$21.439 billion (Sales = 21,439). This company spent \$300 million on capital and \$700 million on wages. What is the residual (in millions of dollars) for this data point? (3%)
- (f) At  $\alpha = 0.05$ , perform an F test and determine whether the coefficients on Capital and wages are all significantly different from 0. (3%)



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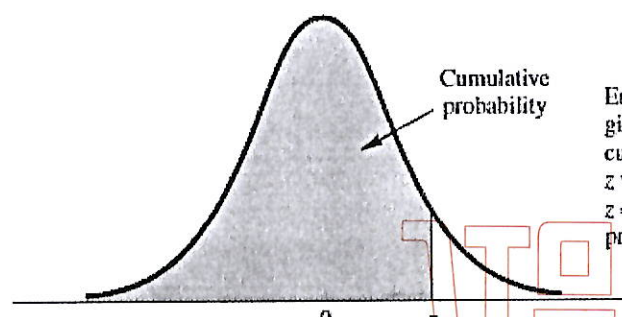
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TABLE 1 CUMULATIVE PROBABILITIES FOR THE STANDARD NORMAL DISTRIBUTION (Continued)



Entries in the table give the area under the curve to the left of the  $z$  value. For example, for  $z = 1.25$ , the cumulative probability is .8944.

$z$	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990

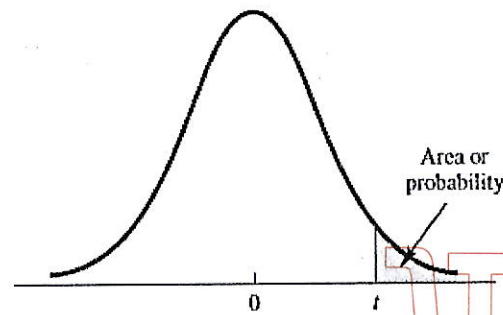
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TABLE 2 *t* DISTRIBUTION

Entries in the table give *t* values for an area or probability in the upper tail of the *t* distribution. For example, with 10 degrees of freedom and a .05 area in the upper tail,  $t_{.05} = 1.812$ .

Degrees of Freedom	Area in Upper Tail					
	.20	.10	.05	.025	.01	.005
1	1.376	3.078	6.314	12.706	31.821	63.656
2	1.061	1.886	2.920	4.303	6.965	9.925
3	.978	1.638	2.353	3.182	4.541	5.841
4	.941	1.533	2.132	2.776	3.747	4.604
5	.920	1.476	2.015	2.571	3.365	4.032
6	.906	1.440	1.943	2.447	3.143	3.707
7	.896	1.415	1.895	2.365	2.998	3.499
8	.889	1.397	1.860	2.306	2.896	3.355
9	.883	1.383	1.833	2.262	2.821	3.250
10	.879	1.372	1.812	2.228	2.764	3.169
11	.876	1.363	1.796	2.201	2.718	3.106
12	.873	1.356	1.782	2.179	2.681	3.055
13	.870	1.350	1.771	2.160	2.650	3.012
14	.868	1.345	1.761	2.145	2.624	2.977
15	.866	1.341	1.753	2.131	2.602	2.947
16	.865	1.337	1.746	2.120	2.583	2.921
17	.863	1.333	1.740	2.110	2.567	2.898
18	.862	1.330	1.734	2.101	2.552	2.878
19	.861	1.328	1.729	2.093	2.539	2.861
20	.860	1.325	1.725	2.086	2.528	2.845
21	.859	1.323	1.721	2.080	2.518	2.831
22	.858	1.321	1.717	2.074	2.508	2.819
23	.858	1.319	1.714	2.069	2.500	2.807
24	.857	1.318	1.711	2.064	2.492	2.797
25	.856	1.316	1.708	2.060	2.485	2.787
26	.856	1.315	1.706	2.056	2.479	2.779
27	.855	1.314	1.703	2.052	2.473	2.771
28	.855	1.313	1.701	2.048	2.467	2.763
29	.854	1.311	1.699	2.045	2.462	2.756
30	.854	1.310	1.697	2.042	2.457	2.750
31	.853	1.309	1.696	2.040	2.453	2.744
32	.853	1.309	1.694	2.037	2.449	2.738
33	.853	1.308	1.692	2.035	2.445	2.733
34	.852	1.307	1.691	2.032	2.441	2.728